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IN RE APPLICATION OF: Schultz *et al.*
APPLICATION NO.: 09/740,615
FILED: December 18, 2000
FOR: **PLASMON RESONANT PARTICLES, METHODS AND APPARATUS**

EXAMINER: Lam, A.
ART UNIT: 1641
CONFIRMATION NO.: 1773

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPEAL BRIEF

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Commissioner for Patents
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Sir:

This is an appeal to the Board of Appeals and Interferences from the decision of Examiner Lam dated May 3, 2006 in which pending claims 19-26, 28 and 29 stand in final rejection.

The present paper is Appellants' Appeal Brief submitted in compliance with 37 C.F.R. §41.37.

REAL PARTY IN INTEREST

The real party in interest is The Regents of the University of California, assignee of all rights and interest in the present application.

RELATED APPEALS AND INTERFERENCES

There are no related appeals of interferences.

STATUS OF THE CLAIMS

Claims 19-26, 28 and 29 are pending and appealed. All of these claims stand rejected. The claims are presented in the Claims Appendix herewith.

STATUS OF AMENDMENTS

Appellants' submitted an Amendment under 37 C.F.R. §1.116 on March 17, 2006. There were minor amendments to dependent claims 26 and 28 to overcome a rejection under 35 U.S.C. §112, second paragraph. An Advisory Action was mailed May 3, 2006, maintaining the rejections of claims 19-26, 28 and 29 under 35 U.S.C. §102(e).

SUMMARY OF CLAIMED SUBJECT MATTER

The claims pending in the application are claims 19-26, and 28-29. The sole independent claim is claim 19, directed to an apparatus (page 18, line 14, and shown at 20 in Fig. 3) for interrogating a field or target (page 17, lines 19-21, and page 18, lines 15-18, and shown at 22 in Fig. 3). The apparatus comprises

an optical light source (page 18, line 19, and shown at 30 in Fig. 3) for illuminating a field (target 22 in Fig. 3, described on page 18, lines 15-18) having a plurality of plasmon resonant entities (PREs) distributed therein (page 17, lines 19-21, and, for example, Example 4, page 42, lines 10-24 and as shown in Fig. 12);

an optical detector for detecting a spectral emission characteristic of individual PREs and other light scattering entities in the field (page 18, lines 25-30, and shown at 58 in Fig. 3, as amended) , when the field is illuminated by the light source, where said optical light source and detector are designed to allow detecting the spectral emission characteristics of PREs and other light scattering entities in the field at each of a plurality of different spectral wavelengths (described generally in Section C2 on page 20, line 16 to page 21, line 34, where it is described that either the illuminating light source may be used to illuminate the target at multiple frequencies, e.g., page 20, lines 25-29) and/or that the detector is designed to detect a spectral emission characteristic

of individual PREs and other light-scattering entities in the illuminated field (page 21, lines 32-34).

an image processor (page 18, lines 31 and 32, and shown at 28 in Fig. 3) operatively connected to the detector for constructing, from signals received from the detector, a computer image of the positions and values of the spectral emission characteristic of individual PREs and other light-scattering entities present in the field at each of said plurality of spectral wavelengths (described on page 18, lines 33-35);

discriminator means for discriminating PREs with a selected spectral signature from other light-scattering entities in the computer image, based on a comparison of a selected spectral characteristic of PREs and other light-scattering entities in the field determined over said different spectral wavelengths (described on page 22, lines 20-34 contained within computer 28 shown at 28 in Fig. 3, e.g., as described at page 19, lines 6-9), and

output means for displaying information about the field based on the information about the selected PREs (e.g., page 4 lines 34-35 and as shown at 60 in Fig. 3) .

There are two means-plus function elements:

1. "Discriminator means for discriminating PREs with a selected spectral signature from other light-scattering entities in the computer image." The discriminator means in the apparatus is described in particular on page 22, line 24 to page 23, line 28, which describes various operations that may be carried out by the discriminator, including, for purposes of outputting the following types of information, the associated discriminator functions:

1. The total number of PREs of a selected type in a field. Here the discriminating step includes counting the number of PREs having a selected range of values of a selected spectral emission characteristic in the constructed computer image;

2. Determining a spatial pattern of PREs having a selected range of values of a selected spectral characteristic in the field. Here the discriminating includes

constructing an image of the relative locations of PREs with those spectral-characteristic values;

3. The distance between two adjacent PREs, particularly where this distance is less than the Rayleigh resolution distance. Here the detecting includes exposing the field with light of one wavelength, to obtain a diffraction image of PREs in the field, exposing the field with light of a second wavelength to obtain a second diffraction image of PREs in the field, and comparing the distance between peaks in the two diffraction patterns;

4. Interrogating a change in the environment of the field. Here the discriminating includes comparing the values of the detected spectral characteristic of a PRE in the field before and after the change, *e.g.*, change in the dielectric of the field;

5. Detecting motion of PREs in the field. The detecting here includes detecting the centers of the diffraction patterns of the PREs in the image plane, as a function of time.

The second means plus function element is the "output means for displaying information about the field based on the information about the selected PREs." It is clear from the specification, e.g., page 4 lines 34-35 and as shown at 60 in Fig. 3, that the output means is a conventional computer display device such as shown at 60 in Fig. 3.

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

There is a single basis of rejection presented for review: Claims 19-26, 28 and 29 stand rejected under 35 U.S.C. §102(e) as anticipated by King *et al.* (U.S. Patent No. 5,633,724).

GROUPING OF THE CLAIMS

The claims in the application stand or fall with independent claim 19.

ARGUMENTS

Claims 19-26, 28 and 29 stand rejected under 35 U.S.C. §102(e) as anticipated by King *et al.* (U.S. Patent No. 5,633,724).

A. Analysis

The standard for lack of novelty, that is, for anticipation, is one of strict identity. To anticipate a claim for a patent, a single prior source must contain all its essential elements. M.P.E.P. § 2131.

Independent claim 19 recites an apparatus having, *inter alia*, the following element:

> a discriminator means for discriminating PREs with a selected spectral signature from other light-scattering entities in the computer image, based on a comparison of a selected spectral characteristic of PREs and other light-scattering entities in the field determined over said different spectral wavelengths.

As a basis for the claim rejections under 35 U.S.C. §102(e), the Examiner asserts that the King *et al.* reference discloses an apparatus comprising "discriminator means (e.g., video camera, 208a, Col. 6, lines 13-20) for discriminating PREs with a selected spectral signature from other light-scattering entities in the computer image, based on a comparison of a selected spectral characteristic of PREs and other light-scattering entities in the field determined over said spectral wavelengths" (final Office Action, second paragraph on page 4). The passage at col. 6, lines 13-20 in King *et al.* is quoted below:

> Detector 208a is preferably a two dimensional detector such as CCD array, image intensified CCD, vidicon or video camera. An optional image intensifier 208b, such as Hamamatsu V4170U, can be used in addition to detector 208a if the optical signal 116 is weak. The provided molecular tags preferably generate fluorescent optical signals, but may also generate time-resolved or nonlinear optical signals.

The Examiner further notes, in the last sentence of the first paragraph on page 7 of the Final Office action that "Alternatively, the video camera is the discriminating means (as stated in the Office action) because it discriminates PREs from other light scattering entities.

The Appellants fail to find any teaching or suggestion in the described CCD array of a device that performs the recited functions of the claimed discriminator means. In specific, nowhere can the Appellants find in the cited passage in King *et al.* any teaching or suggestion of a CCD array that functions to:

(i) compare a selected spectral characteristic of PREs and other light-scattering entities in the field determined over different wavelengths, and

(ii) use such comparison to discriminate PREs with a selected spectral signature from other light scattering entities.

Further, it is not clear how a CCD array would perform these functions, and the Examiner has failed to provide evidence of any known CCD that would be capable of performing these functions. A CCD array, like any electronic light detector, simply converts photon events to electrical signals that can be displayed or further processed by an electronic processor in a variety of ways.

Also in the top paragraph of page 7 of the Final Office, and to further buttress the argument that King et al. discloses a "discriminator means," the Examiner makes the following statements:

Statement 1: "King et al. specifically teaches that the optical signal is detected and the resulting pattern of light and dark pixels may be analyzed by a computer appropriate for analyzing such patterns. (col. 4, lines 53-55)."

Statement 2: "King et. al. also teaches that that the different frequencies and light intensities may be utilized to result in the maximum optical signal from the molecular tags, in such a way that the evanescent field can excite only some of the pixels of the array (col. 5, lines 30-34);"

Statement 3: "King teaches that a computer is connected to the detection system for collecting and analyzing the data generated by the detection system (col. 5, lines 58-60)."

Statement 4: "Thus, King et al. teaches a computer for discriminating PREs from other light scattering entities in the computer image based on a comparison of selected spectral characteristics of PREs and other light scattering entities in the field.

With all due respect, there are two fundamental problems with the Examiner's argument. First, the Appellants note that the cited passages that are used to "construct" a disclosure of the claimed discriminator means are three relatively short passages taken from different paragraphs (and in the case of Statement 1, different sections) of the King reference. What, it can be asked, connects these teachings other than the Examiner's hindsight reconstruction of the Appellants' claimed invention? The Examiner has failed to demonstrate that the three statements, standing apart as they do, would be connected by a person skilled in the art to disclose or suggest the claimed discriminator means.

A second, and more fundamental objection, is that the first three statements do not, in fact, logically lead to the conclusion reached in Statement 4, even it they were presented in the patent as part of a single concept. Considering each of the three statements, and the context in which they appear in the King *et al.* reference:

Statement 1. Col. 4, lines 53-55 of the reference simply notes that the optical signal is analyzed by a device, e.g., a computer. There is no disclosure of what optical signal is analyzed (other than the fact that the optical signal consists of light and dark pixels, which would be true of any meaningful optical signal), nor what analysis is carried out on the signal.

Statement 2. Col. 5, lines 30-34 of the reference notes that the irradiating light beam is provided with the correct frequency and intensity properties to optimize the optical signal from molecular tags. Rather than suggesting a device that involves generating spectral features that can be analyzed by a discriminator, this passage suggests that the system is simply operated in a mode where the irradiating beam is

optimized to a given frequency and intensity at which "one, some, or all of the pixels" of the array are excited. More particularly, for purposes of the present invention, the above quoted passage statement nowhere shows or suggests:

(i) comparing a selected spectral characteristic of PREs and other light-scattering entities in the field determined over different wavelengths, and

(ii) using such comparison to discriminate PREs with a selected spectral signature from other light scattering entities.

Statement 3. Col 5, lines 58-60 simply notes that a computer is connected to a detection system for electronically collecting and analyzing the data generated by the detection system. The same comments made with respect to Statement 1 apply here: Nowhere does this passage indicate what optical signals are analyzed nor what analysis is carried out on the signal.

In summary, the Examiner has extracted three unrelated passages from King *et al.*, and strung them together to reach a conclusion that has no logical basis in the King disclosure.

In the Advisory Action dated 4/19/06, the Examiner makes the additional statements (Addtriional statements 1-3), in support of the position that King *et al.* discloses a discriminator means:

Additional statement 1: The optical data being detected, and thus the data collected and analyzed by the computer is fluorescence (col 4, line 65 and column 5, line 23).

Additional statement 2: Moreover, the King reference discloses that the array may have different molecules suitable for binding to different target substances and thus by detecting which of the molecules are excited, the presence of a target substance can be determined (column 4, lines 66-67).

Additional statement 3: Detecting different molecules in an array by exciting one or some of the molecules using the maximum optical signal is discriminating between the PREs, at a selected spectral characteristic, e.g., fluorescence wavelength, determined over different spectral wavelengths.

Once again, the Examiner has combined two statements from King *et al.* to reach a conclusion (Additional statement 3) that is not supported by the cited statements. Additional statements 1 and 2 are used to make the point that the apparatus in King *et al.* can be operated to detect different frequencies of fluorescent emitters and thus can be operated to discriminate different populations of fluorescent reporters. However, that is true any optical device that can be operated at different excitation or detection frequencies, for purposes of detecting different reporter molecules. However, the Examiner's conclusion (Additional statement 3) that this shows that King *et al.* discloses a discriminator means is entirely misplaced, since the ability to discriminate different population of fluorescent reporters in King *et al.* is based entirely on human activity, by selecting different excitation or detection wavelengths, and by viewing displays taken at different excitation or detection wavelengths. This capability of the King *et al* device does not require a separate computer-driven discriminator means, nor is such a discriminator means shown or suggested in King *et al.*

More particular, nowhere can the Appellants find in the newly cited passages any structure in King *et al.* that functions to:

(i) compare a selected spectral characteristic of PREs and other light-scattering entities in the field determined over different wavelengths, and

(ii) use such comparison to discriminate PREs with a selected spectral signature from other light scattering entities.

Since King *et al.* does not disclose the claimed discriminator means of claim 19, neither claim 19, nor any of claims 20-26, 28, and 29 dependent thereon, can be anticipated by the King *et al.* reference.

CONCLUSIONS

In view of the foregoing remarks, Appellants submit that the pending claims are in condition for allowance and urge the Board to overturn the Examiner's rejections.

Respectfully submitted,

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APPENDIX A: CLAIMS ON APPEAL

19. An apparatus for interrogating a field, comprising

an optical light source for illuminating a field having a plurality of plasmon resonant entities (PREs) distributed therein,

an optical detector for detecting a spectral emission characteristic of individual PREs and other light scattering entities in the field, when the field is illuminated by the light source, where said optical light source and detector are designed to allow detecting the spectral emission characteristics of PREs and other light scattering entities in the field at each of a plurality of different spectral wavelengths,

an image processor operatively connected to the detector for constructing, from signals received from the detector, a computer image of the positions and values of the spectral emission characteristic of individual PREs and other light-scattering entities present in the field at each of said plurality of spectral wavelengths,

discriminator means for discriminating PREs with a selected spectral signature from other light-scattering entities in the computer image, based on a comparison of a selected spectral characteristic of PREs and other light-scattering entities in the field determined over said different spectral wavelengths, and

output means for displaying information about the field based on the information about the selected PREs.

20. The apparatus of claim 19, wherein said light source includes a bright field/dark field lens for directing light onto the field.

21. The apparatus of claim 19, wherein said light source includes means for illuminating the field at each of said plurality of different spectral wavelengths.

22. The apparatus of claim 19, wherein said detector is a two-dimensional photodetector array capable of detecting a spectral emission characteristic simultaneously from a plurality of illuminated PREs in an illuminated field.

23. The apparatus of claim 19, wherein said detector includes means for spectrally separating light emitted from the PREs into said plurality of different spectral wavelengths, and said image processor operates to form a computer image of the positions and values of the emission spectral characteristic of individual PREs and other light-scattering entities present in the field at each of a said plurality of different emission wavelengths.

24. The apparatus of claim 23, wherein the optical detector includes a two-dimensional array of optical fibers whose output is aligned so as to constitute a line source that is sent into a grating or prism for responding to that line source, and a two-dimensional detector array for responding to the spread of spectral light of each fiber in said line source of detected light.

25. The apparatus of claim 19 or 23, which further includes means for moving said field in an x-y plane, relative to said light source, to successively illuminate individual light-scattering entities in the field.

26. The apparatus of claim 19, wherein said image processor operates to construct an image of PRE positions and, for each light-scattering entity in the field, values of a spectral characteristic selected from the group consisting of peak position, peak intensity, peak width at half intensity of the spectral emission curve, peak halfwidth in the image plane, and polarization or angle of incidence response.

28. The apparatus of claim 19, wherein said discriminator means includes means for discriminating PREs with a selected spectral signature from all other light-

scattering entities in the field, based on detected values, for each light-scattering entity in the field, of peak position, peak intensity, peak width at half intensity of the spectral emission curve, peak halfwidth in the image plane, and polarization or angle of incidence response.

29. The apparatus of claim 19, wherein said discriminating is effective to discriminate for a selected type of PREs, those selected PREs which are interacting with one another and those which are not, or one selected type of PRE from another selected type of PRE in the field.

APPENDIX B: EVIDENCE

No evidence submitted by Appellant pursuant to 37 C.F. R. §§ 1.130, 1,131, or 1.132 or submitted by the Examiner is relied on in this appeal.